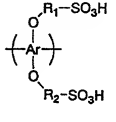
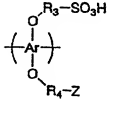
WHAT IS CLAIMED IS:

1. A fuel cell which comprises an electrode assembly having an electrode catalyst membrane formed therein, said catalyst membrane comprising a polymer electrolyte membrane held between an anode on one side of the principal plane of the electrolyte membrane and a cathode on the other side of the principal plane thereof, gas diffusion seats provided each independently, in close contact, to the anode side and the cathode side of the assembly, and electroconductive separators having gas supply passages to the anode and to the cathode provided on the outside surfaces of the gas diffusion seats, wherein the polymer electrolyte membrane comprises a polyarylene wherein sulfonic acid groups are bonded to aromatic rings via alkylene ether linkages.

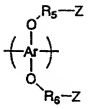
2. An ion exchange resin which comprises an arylene copolymer having at least two of the repeating structural units represented by the formulas (I), (II) and (III)



(I)

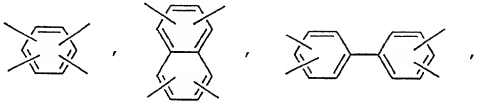


(II)



(III)

wherein Ar is at least one of the following linked structures represented by the formulas (IV), (V) and (VI)

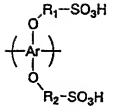


(IV) (v) (VI)

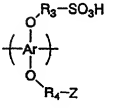
R_1-R_6 are each a group independently selected from the group of alkyl groups having 1-6 carbon atoms, and Z is hydrogen or the methyl group.

3. The ion exchange resin according to claim 2 wherein the ion exchange group equivalent weight of the copolymer is 500-2,500 g/mol.

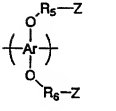
4. The fuel cell according to claim 1 wherein the polyarylene which is the polymer electrolyte wherein sulfonic acid groups are bonded to aromatic rings via alkylene ether linkages is an ion exchange resin which comprises an arylene copolymer having at least two of the repeating structural units represented by the formulas (I), (II) and (III)



(I)

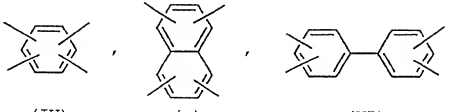


(II)



(III)

wherein Ar is at least one of the following linked structures represented by the formulas (IV), (V) and (VI)



(IV) (V) (VI)

R_1-R_6 are each a group independently selected from the group of alkyl groups having 1-6 carbon atoms, and Z is hydrogen or the methyl group.

5. A process for producing the ion exchange resin according to claim 2 wherein the ion exchange resin is produced by the method of oxidative coupling polymerization.

6. A process for producing a polymer electrolyte comprising a step of dissolving the ion exchange resin according to claim 2 in a solvent, a step of coating the resin solution obtained on a substrate to form a coating film, and a step of drying the coating film to remove the solvent.

7. A polymer electrolyte composite membrane in which the ion exchange resin according to claim 2 is filled into the pore part of at least a part near the surface of a porous sheet and which is impermeable to gaseous fluids.

8. A polymer electrolyte composite membrane in which the ion exchange resin according to claim 2 is filled completely into the whole pore region of a porous sheet and which is impermeable to fluids.

9. A solution for electrode catalyst coating which comprises the ion exchange resin according to claim 2 dissolved in a solvent.

10. An electrode paste for a fuel cell which comprises carbon particles carrying a metal catalyst dispersed in the solution for electrode catalyst coating according to claim 9.

11. The electrode paste for a fuel cell according to claim 10 wherein the metal catalyst is platinum or its alloy.

12. A process for producing an electrode assembly having an electrode catalyst formed therein which comprises a step of coating the electrode for a fuel

cell according to claim 10 on the principal plane of a polymer electrolyte membrane of polyarylene type wherein sulfonic acid groups are bonded to aromatic rings via alkylene ether linkages, followed by drying.

13. A process for producing an electrode assembly having an electrode catalyst formed therein which comprises a step of coating the electrode paste for a fuel cell according to claim 10 on a gas diffusion seat having electronic conductivity, followed by drying, and a step of adhereing the coated surface of the diffusion seat to the both sides of the principal plane of a polymer electrolyte membrane of polyarylene type wherein sulfonic acid groups are bonded to aromatic rings via alkylene ether linkages.

14. A portable power source comprising, in a case, a fuel cell proper and a hydrogen bomb which stores hydrogen to be supplied to the fuel cell proper wherein the fuel cell is the fuel cell according to claim 1.

15. A fuel cell power generating apparatus comprising a reformer which reforms a fuel gas into an anode gas containing hydrogen, a fuel cell which generates electricity from the anode gas and a cathode gas containing oxygen, and a heat exchanger which exchanges heat between a high temperature anode gas which has come out from the reformer and a low temperature fuel gas supplied to the reformer, wherein the fuel cell is the fuel cell according to claim 1.